VOICE CONTROL SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This application is based on and incorporates herein by reference Japanese Patent Application No. 2002-197262 filed on July 05, 2002.

FIELD OF THE INVENTION

The present invention relates to a voice control system that enhances usability in voice input manipulation with having an auxiliary display.

BACKGROUND OF THE INVENTION

A speech uttered by a speaker is conventionally used for controlling various functions of a camera or a car navigation device. For instance, in JP-A-S64-56428, a camera control system using voice input is described as follows: a speech corresponding to required manipulation is inputted; the speech is recognized by a voice recognition unit; and the camera is controlled based on a control processing corresponding to a recognition result.

In this voice-controlled camera, a certain function can be executed by a certain voice command having one-to-one correspondence with the certain function. For instance, only "no strobe" can be functional as the certain voice command for prohibiting a strobe light at shooting, even though "strobe off," "stop strobe," or "flash off" may be used depending on a

user.

A user therefore needs to correctly memorize a certain voice command that enables a certain function to be executed. However, user's workload increases with increasing executable functions. This results in worsening usability in voice input.

In voice recognition, a shorter word is apt to be mis-recognized. For instance, there is a case where a user inputs an address of a destination through voice input in a car navigation device and is then required for determining whether a point designated on a map is correct as a destination. In this case, the user sets or cancels the destination by uttering "YES" or "NO," respectively. However, the short word of "YES" or "NO" is apt to be mis-recognized, so that a function of setting the destination is sometimes executed against user's intention.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a voice control system that enhances usability of voice input manipulation with an auxiliary display.

To achieve the above object, a voice control system having a display is provided with the following. When a user inputs a speech, an auxiliary switch is displayed for executing an auxiliary function of inputting the speech. When the auxiliary switch is selected, the auxiliary function is executed. In this structure, the auxiliary switch can be used for a case where mis-recognizable voice input may be apt to happen. This results in improving usability of a voice control

system in comparison with a voice control system that uses voice input alone.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description made with reference to the accompanying drawings. In the drawings:

FIG. 1 is a schematic block diagram showing structure of a car navigation device including a voice control system according to an embodiment of the present invention;

FIG. 2 is a flow diagram explaining processing of voice recognition in the car navigation system;

FIG. 3 is a schematic diagram explaining an instance of an assist window and auxiliary switches for assisting voice input manipulation on a display unit;

FIG. 4 is a schematic diagram explaining another instance of an assist window and auxiliary switches for assisting voice input manipulation on the display unit; and

FIG. 5 is a schematic diagram explaining other instance of an assist window and auxiliary switches for assisting voice input manipulation on the display unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A car navigation device provided in a vehicle will be explained as an embodiment that a voice control system of the present invention is directed to.

As shown in FIG. 1, the car navigation device includes a position detection section that includes: a global positioning system (GPS) receiver 9; a speed sensor 10; a geomagnetic sensor 11; and a gyroscope 12, all of which are connected with a navigation electronic control unit (ECU) 1. The car navigation device further includes: a voice recognition (VR) unit 4 having a microphone 2 and talk switch 3; a map data input unit 13; and a manipulation switch input unit 8, all of which are also connected with the navigation ECU 1. Furthermore, a display unit 5, a speaker 6, and an external input/output (I/O) unit 7 are connected with the navigation ECU 1.

The navigation ECU 1 is formed as a known computer and includes internal components such as a CPU, a ROM, a RAM, and an input/output (I/O) circuit, and a communications bus that connects the internal components. The ROM is stored with a program that is executed in the navigation device, and the CPU processes according to the program. The program can be obtained through the external I/O unit 7.

As explained above, the position detection section includes, as position sensors, the GPS receiver 9, the speed sensor 10, the geomagnetic sensor 11, and the gyroscope 12. Each of them has respectively differently natured error range, so that a position is calculated by using plural sensors with adjusting each another. In addition, according to accuracy of each sensor, the position detection section can be formed of part of the above position sensors. A revolution sensor for detecting steering position or a yaw rate sensor can be used for

detecting the position.

The map data input unit 13 is for inputting, to the navigation ECU 1, map data such as road data or landmark data. The unit 13 includes storage for storing the map data. As the storage, a CD-ROM or a DVD-ROM is generally used due to data volume of the map data. However, a memory card or a hard disk drive can be also used.

The display unit 5 is formed of a liquid crystal display. The display unit 5 shows, on its screen, the map data from the map data input unit 13, an own vehicle mark based on a current position detected by the position detection section, and additional data such as a guiding route.

The external I/O unit 7 is for receiving outside information such as Vehicle Information and Communication System (VICS) or sending out information. The outside information is processed by the navigation ECU 1. The processed information such as traffic jam information or traffic regulation information is superimposed on the map data shown on the screen of the display unit 5. When needed, information processed by the navigation ECU 1 is sent out through the external I/O unit 7.

The manipulation switch input unit 8 is used for input and is formed of a touch switch integrated into the display unit 5, a mechanical switch, or the like. The navigation device of this embodiment has a function of route assistance. Here, when position of a destination is inputted through the manipulation switch input unit 8, an appropriate route from the current position to the destination is automatically selected and shown

on the screen of the display unit 5.

The microphone 2 and the talk switch 3 are used for voice input. As a press button of the talk switch 3 is pressed, an input trigger is sent to the VR unit 4. As the VR unit 4 receives the input trigger, it shifts to a voice input mode of accepting the voice input through the microphone 2.

At the voice input mode, when a user utters a speech of "current position," the speech is converted to a voice signal through the microphone 2 and sent to the VR unit 4. The VR unit 4 recognizes the voice signal, and converts it into a manipulation command corresponding to the speech. The VR unit 4 then sends the manipulation command to the navigation ECU 1. Thus, the speech is recognized as "CURRENT POSITION" and converted into the manipulation command of "DISPLAY CURRENT POSITION." The navigation ECU 1 that receives this manipulation command displays a road map surrounding the current position on the screen of the display unit 5.

The speaker 6 is used for outputting voice guidance or various alarms. For instance, it can be a speaker that is previously installed in the vehicle or a speaker that is built in the car navigation device.

Processing of the car navigation device will be explained below from when a voice is inputted to when a function based on the inputted voice is executed, referring to FIG. 2.

At Step 10, a waiting state continues till the talk switch 3 is pressed by a user, and processing proceeds to Step 20 when the talk switch 3 is pressed.

At Step 20, the VR unit 4 shifts to the voice input mode where the voice input can be received.

At Step 30, almost simultaneously with above shifting to the voice input mode, an assist window and auxiliary switches for assisting the voice input manipulation are shown on the screen of the display unit 5 by the navigation ECU 1.

Instances of the assist window and the switches are shown within a screen in an upper portion of FIG. 3. The instances are shown when the VR unit 4 shifts to the voice input mode. The assist window shows "UTTER COMMAND" for notifying that the voice input can be presently accepted. The auxiliary switches of "STOP" and "HELP" are also shown.

Here, in order to execute a function of the navigation device through the voice input, a voice command corresponding to the function must be properly uttered. Furthermore, for instance, regarding setting of a destination, there are various input methods that use an address, a phone number, a building name, a genre (such as restaurant and gas station), and the like. Furthermore, in each of the input methods, prescribed commands are needed to be accurately uttered in a prescribed order.

However, it is very difficult for the user to thoroughly memorize rules of the voice input manipulation and voice commands. This results in adversely affecting usability of the voice input manipulation.

In this embodiment, "HELP" is provided, as an auxiliary switch of voice input manipulation, along with the assist window

so that the voice input manipulation can be smoothly operated even if the rules or the voice commands are forgotten.

For instance, in a case that the manipulation switch input unit 8 is integrated into the display unit 5 as a touch switch, the auxiliary switch of "HELP" is selected by being touched on the display area of "HELP." Here, the touch switch is preferable provided in the display unit 5 so that the auxiliary switch can be easily selected by just being touched. Easy manipulation of the touch switch enhances improvement of providing the auxiliary switch.

At Step 40, it is determined whether one of the auxiliary switches is selected. When the one of the auxiliary switches is determined to be selected, the processing proceeds to Step 50.

At Step 50, an auxiliary function corresponding to the selected auxiliary switch is executed. Here, when the switch of "HELP" is selected, a voice recognition (VR) manipulation HELP window is shown with including a list of commands that are recognizable by voice input, as shown on a screen in a lower portion of FIG. 3. When the list needs more area of a one-page window, any desired command included in the list can be selected through touching a scroll button located in the leftmost portion of the HELP window.

A switch of "MANIPULATION GUIDE" is also shown within the HELP window. When this switch is selected, guidance such as the above-mentioned rules for the voice input manipulation can be shown. Furthermore, a switch of "END" is shown within the

HELP window. When this switch is selected, this HELP window can be erased.

Along with the auxiliary switch of "HELP," another auxiliary switch of "STOP" is provided for stopping the voice input mode, as shown within the screen in the upper portion of FIG. 3. Typically, after the voice input mode is started, stopping of the voice input mode must be instructed through the voice input. Providing the auxiliary switch of "STOP" enables mis-recognition of voice to be prevented and the voice input to be securely stopped.

Furthermore, the auxiliary switches of "HELP" and "STOP" can be also selected through voice input. When voice of "HELP" or "STOP" inputted through a microphone 2 is recognized, display of the above voice recognition (VR) manipulation HELP window or stopping of the voice input mode is executed respectively.

When a voice command is inputted by the user while the assist window or the HELP window is shown on the screen of the display unit 5 as explained above, processing of voice recognition is executed at Step 60 in FIG. 2. In the voice recognition, the inputted voice command is collated with speech contents previously stored as reference commands, so that a speech content corresponding to the inputted voice command is extracted.

At Step 70, a function corresponding to the extracted speech content is executed.

In the next place, other instances of the assist window and auxiliary switches for assisting the voice input

manipulation will be explained below with referring to FIGs. 4 and 5.

A display instance in FIG. 4 is a display shown after a target destination is inputted with an address, a phone number, or a building name. At setting of a destination, there is a case where an inputted position or building as the target destination is not directly determined as a destination but once shown on the screen along with being superimposed on the map (not shown in FIG. 4) for seeking user's confirmation.

In this case, "IS THIS POINT SET AS DESTINATION?" in the assist window is displayed along with auxiliary switches of "YES" and "NO."

Here, although a short word of "YES" or "NO" is inputted as a voice input, the short word is apt to be mis-recognized in the voice recognition. As a result, even though the user inputs a proper destination through the voice input, setting of the destination is sometimes cancelled, against user's intention, in such a final confirmation step. When the short word or command is inputted through the voice input, addition of switch manipulation input to the voice input can therefore inhibit an unintended function from being executed.

Voice announcement through the speaker 6 can be used along with the assist window on the display unit 5. However, functions that are to be executed such as setting of the destination should be preferentially shown on the screen of the display unit 5 so that the user can visually confirm it.

Another instance in FIG. 5 is a display for accepting a

phone number through voice input. This display is shown after the voice input mode is started by pressing of the talk switch 3 and then "SEARCH BY PHONE NUMBER" is inputted through the voice input, as shown in FIG. 5.

In this case, "LONG-DISTANCE NO. FIRST" in the assist window is displayed for notifying that the user can input the phone number through the voice input. Here, auxiliary switches of "STOP" and "HELP" are shown simultaneously. When the switch of "STOP" is selected, accepting of the phone number is terminated and the display returns to the initial display shown on the screen in the upper portion of FIG. 3.

When the switch of "HELP" is selected, "MANIPULATION GUIDE" showing instruction regarding voice input is shown on the screen of the display unit 5. In detail, there are instructions such as "UTTER LONG-DISTANCE AND LOCAL NO. SEPARATELY" or "NOT FIGURE-INCLUDED READING, BUT SERIAL READING BY DIGIT." The user thereby inputs voice with considering the instruction. This results in enhancing recognition degree of the inputted phone numbers and to thereby enable the user to smoothly manipulate the voice input.

(Modification)

The assist window or the auxiliary switches are limited to the above-mentioned instances.

For instance, there is a case that a phone number of a destination is inputted while a preset destination is already set. Here, an assist window is shown as inquiring whether the preset destination is altered to the newly inputted destination

or the newly inputted destination is added as a passing point. The auxiliary switches can be "ALTER" or "ADD."

Here, although "ALTER" or "ADD" is apt to be misrecognized, providing of the auxiliary switches enables executing of a relevant function as the user intends.

In the above embodiment, the VR unit 4 is constructed separately from the navigation ECU1. However, the VR unit 4 can be integrated into the navigation ECU 1.

Furthermore, the present invention can be directed not only to the car navigation device but also other devices such as an electric appliance or a robot, to which the voice recognition can be adopted.

It will be obvious to those skilled in the art that various changes may be made in the above-described embodiments of the present invention. However, the scope of the present invention should be determined by the following claims.